

# Digital Elevation Models of East Louisiana and West Mississippi Coasts: Procedures, Data Sources, and Analysis

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## Summary

In September of 2020, NOAA's National Centers for Environmental Information (NCEI) developed integrated bathymetric–topographic digital elevation models (DEMs) according to specifications developed jointly by NOAA NCEI and the United States Geological Survey (USGS) to help better define a consistent elevation mapping framework for the nation (Table 1). Overall, 121 tiled DEMs were created in the area of interest: 97 tiles were created at the highest resolution of 1/9<sup>th</sup> arc-second and 24 were created at a resolution of 1/3<sup>rd</sup> arc-second. Only 1/9<sup>th</sup> arc-second DEM tiles integrate topography and bathymetry. The DEM tiles represent best publicly-available data at the time of their creation; the intent is to update specific tiles as new source data becomes available. The utilization of a tiling scheme in developing the DEMs is intended to improve data management during source data processing as well as facilitate targeted DEM updates.

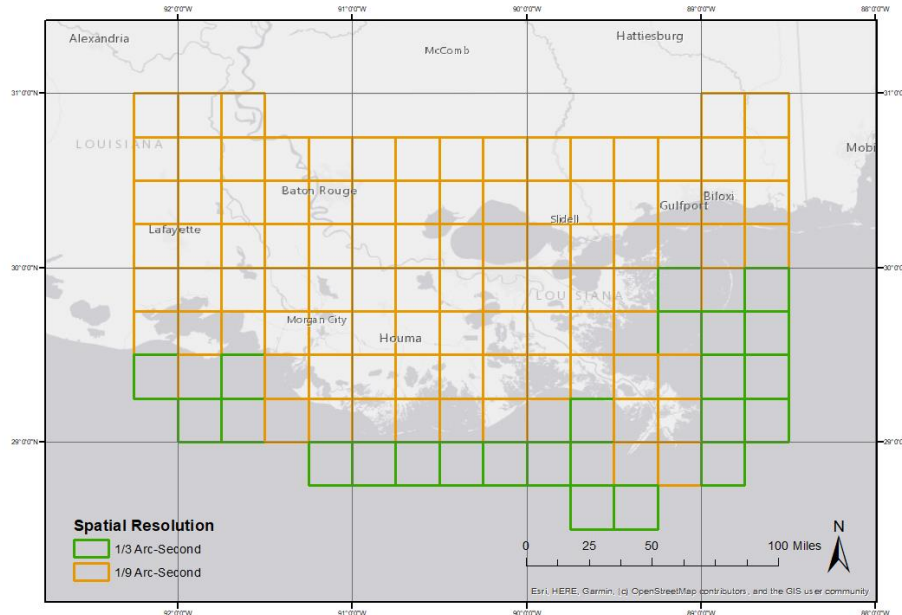
The tiled DEMs cover the East Louisiana and West Mississippi coast between Lafayette, LA and Biloxi, MS. The extents of these DEMs, procedures, data sources, and analysis are described below. The methodologies used by NCEI in developing DEMs are described in the NOAA National Centers for Environmental Information Topo-Bathymetric Digital Elevation Models: East Florida (Amante, 2018).

**Table 1.** Specifications for the DEM tiles.

<i>Grid Area</i>	<i>East Louisiana/West Mississippi</i>
Coverage Area	92.25° to 88.50° W, 28.5° to 31.00° N
Coordinate System	Geographic decimal degrees
Horizontal Datum	NAD 83
Vertical Datum	NAVD 88
Vertical Units	Meters
Cell Size	Variable (1/9 <sup>th</sup> or 1/3 <sup>rd</sup> Arc-Second)
Grid Format	Geotiff

# DEM Specifications

The East Louisiana tiled DEMs were built to the specifications listed in Table 1. Figure 1 shows the 1/9<sup>th</sup> arc-second DEM tile boundaries in orange and the 1/3<sup>rd</sup> arc-second DEM tile boundaries in green.



**Figure 1.** Map image of the DEM tile boundaries for the East Louisiana/West Mississippi DEMs.

## Data Sources and Processing

Bathymetry data used in the generation of the East Louisiana/West Mississippi DEMs included NOAA National Ocean Service (NOS) hydrographic surveys and bathymetric attributed grids (BAGs), NOAA Office of Coast Survey (OCS) electronic navigational charts (ENCs), NOAA NCEI multibeam survey data, and U.S. Army Corps of Engineers (USACE) channel condition surveys (Table 2).

**Table 2:** Bathymetric data sources used in DEM development.

Source	Date	Data Type	Spatial Resolution	Horizontal Datum	Vertical Datum
NOAA OCS electronic navigational chart (ENC) extracted soundings	1966 - 2019	XYZ	< 10 meters to several kilometers	WGS84	Mean Lower Low Water (MLLW)
NOAA NCEI multibeam	2008 - 2016	XYZ	~1 to 10 meters	NAD83	Assumed instantaneous water level

bathymetric surveys					
USACE hydrographic channel condition surveys	2011 - 2020	XYZ	~1 to 10 meters	NAD83	Assumed instantaneous water level
USACE Lower Mississippi Bathymetry	2017	Gridded bathymetry	10m	WGS84	Mean Lower Low Water (MLLW)
NOAA BAG	2017	Gridded Bathymetry	< 1 meter to ~10 meters	UTM 15N	Mean Lower Low Water (MLLW)
NOAA NOS hydrographic surveys	1934 - 2006	XYZ	< 10 meters to several kilometers	WGS84	Mean Lower Low Water (MLLW)

With the exception of the NOAA NCEI multibeam bathymetric surveys, bathymetric data were transformed from mean lower low water (MLLW) to NAVD88. Vertical datum transformations were performed using NOAA's VDatum Software. Where more recent, higher resolution data existed, older data were edited or superseded.

Topographic and topographic/bathymetric data used in developing East Louisiana/West Mississippi DEMs included lidar data from the U.S. Geological Survey (USGS), USACE and NOAA (INEGI; Table 3).

**Table 3:** Topographic data sources used in DEM development.

Source	Date	Data Type	Resolution	Horizontal Datum	Vertical Datum
Post Gustav Lidar (1061)	2009	lidar	~1m	WGS84	NAVD88
NCMP LA/MS Lidar (1065)	2010	lidar	~1m	WGS84	NAVD88
Chandleur Islands Louisiana lidar (1066)	2010	lidar	~1m	WGS84	NAVD88
North Gulf lidar post Ivan (1123)	2004	lidar	~1m	WGS84	NAVD88
ARRA Louisiana region 1 lidar (1403)	2011	lidar	~1m	WGS84	NAVD88
ARRA Louisiana region 2 lidar (1404)	2011	lidar	~1m	WGS84	NAVD88
Atchafalay Basin LA lidar (1433)	2010	lidar	~1m	WGS84	NAVD88
Hancock and Jackson Counties lidar (26)	2005	lidar	~1m	WGS84	NAVD88
NCMP AL/MS/LA/ lidar (2610)	2011	lidar	~1m	WGS84	NAVD88
2005 Post Katrina lidar (28)	2005	lidar	~1m	WGS84	NAVD88
Mississippi merged lidar data (36)	2005	lidar	~1m	WGS84	NAVD88
Harrison County MS lidar mapping (39)	2004	lidar	~1m	WGS84	NAVD88
USGS Northern Gulf lidar (522)	2007	lidar	~1m	WGS84	NAVD88
USGS Pearl River lidar (540)	2008	lidar	~1m	WGS84	NAVD88
USGS Jean Lafitte lidar (578)	2006	lidar	~1m	WGS84	NAVD88
Mississippi Pearl River lidar (64)	2003	lidar	~1m	WGS84	NAVD88
NCMP LA/MS Lidar (8664)	2010	lidar	~1m	WGS84	NAVD88
LA Barataria (4746)	2013	lidar	~1m	WGS84	NAVD88
LA Atchafalaya (4747)	2013	lidar	~1m	WGS84	NAVD88
NCMP MS (4749)	2012	lidar	~1m	WGS84	NAVD88
NRCS SE (4907)	2015	lidar	~1m	WGS84	NAVD88
1061	2015	lidar	~1m	WGS84	NAVD88
George Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88

Greene Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
Hancock Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
Harrison Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
Jackson Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
Lamar Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
Marion Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
Pearl River Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
Perry Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
Stone Lidar (5168)	2015	lidar	~1m	WGS84	NAVD88
NCMP MS (5186)	2016	lidar	~1m	WGS84	NAVD88
MS South (8563)	2016	lidar	~1m	WGS84	NAVD88
LA Upper Delta Plain (8564)	2017	lidar	~1m	WGS84	NAVD88
LA Chenier Plain (8597)	2017	lidar	~1m	WGS84	NAVD88
MS Natchez Trace	2016	lidar	~1m	WGS84	NAVD88
NCMP MS (8626)	2018	lidar	~1m	WGS84	NAVD88
Post Michael DEM	2018	Bathymetric/Topo graphic DEM	1m	WGS84	NAVD88
Gulf Topobathy DEM	2016	Bathymetric/Topo graphic DEM	3m	WGS84	NAVD88
Louisiana CONED	2014	Bathymetric/Topo graphic DEM	1m	UTM 15N	NAVD88

## DEM Development

Development of the East Louisiana/West Mississippi DEM tiles followed procedures documented in NOAA National Centers for Environmental Information Topo-Bathymetric Digital Elevation Models: East Florida (Amante, 2018). Exceptions being that the bathymetric pre-surface was generated at 1 arc-second due to the coarse resolution of offshore bathymetric data, and gridding weights were modified as shown in Table 5. The bathymetric pre-surface derived from data sources in Tables 2 and 3 was converted to XYZ and was utilized in the final DEM creation. Older, coarse, and/or inaccurate bathymetric surveys from NOAA NOS hydrographic surveys, NOAA NCEI multibeam bathymetric surveys, and NOAA OCS electronic navigational chart (ENC) extracted soundings were used in the bathymetric pre-surface generation but were not used as source datasets in the final DEM creation. An additional interpolated dataset derived from the USACE hydrographic channel condition surveys was also included in the bathymetric pre-surface generation and final DEM creation to guide interpolation between sparse channel conditional survey profiles and more realistically represent the dredged channels.

**Table 4:** Data hierarchy used to assign gridding weights in MB-System's 'mbgrid.'

Dataset	Relative Gridding Weight
Post Gustav Lidar (1061)	0.5
NCMP LA/MS Lidar (1065)	0.5
Chandleur Islands Louisiana lidar (1066)	0.5
North Gulf lidar post Ivan (1123)	0.5
ARRA Louisiana region 1 lidar (1403)	0.5
ARRA Louisiana region 2 lidar (1404)	0.5
Atchafalaya Basin LA lidar (1433)	0.5

Hancock and Jackson Counties lidar (26)	0.5
NCMP AL/MS/LA/ lidar (2610)	0.5
2005 Post Katrina lidar (28)	0.5
Mississippi merged lidar data (36)	0.5
Harrison County MS lidar mapping (39)	0.5
USGS Northern Gulf lidar (522)	0.5
USGS Pearl River lidar (540)	0.5
USGS Jean Lafitte lidar (578)	0.5
Mississippi Pearl River lidar (64)	0.5
NCMP LA/MS Lidar (8664)	0.5
LA Barataria (4746)	2.0
LA Atchafalaya (4747)	2.0
NCMP MS (4749)	2.0
NRCS SE (4907)	2.0
George Lidar (5168)	2.0
Greene Lidar (5168)	2.0
Hancock Lidar (5168)	2.0
Harrison Lidar (5168)	2.0
Jackson Lidar (5168)	2.0
Lamar Lidar (5168)	2.0
Marion Lidar (5168)	2.0
Pearl River Lidar (5168)	2.0
Perry Lidar (5168)	2.0
Stone Lidar (5168)	2.0
NCMP MS (5186)	1.0
MS South (8563)	2.0
LA Upper Delta Plain (8564)	2.0
LA Chenier Plain (8597)	2.0
MS Natchez Trace	2.0
NCMP MS (8626)	2.0
Post Michael DEM	4.0
Gulf Topobathy DEM	2.0
Louisiana CONED	0.5
Louisiana CONED	0.5
USGS Bayou Nezpique lidar	1.0
NOAA OCS electronic navigational chart (ENC) extracted soundings	0.1
NOAA NCEI multibeam bathymetric surveys	0.1
USACE hydrographic channel condition surveys	0.1
USACE Lower Mississippi Bathymetry	50.0
NOAA BAG	2.0
NOAA NOS hydrographic surveys	0.1
USGS Louisiana CONED	0.5

## DEM Analysis

Once the East Louisiana/West Mississippi DEMs were generated, the DEMs were compared to the high-resolution source elevation data and high-resolution imagery. Inconsistencies were evaluated and resolved based on the most reliable data available. The largest outstanding issues with the DEM tiles are the lack of publicly-available high-resolution datasets for much of the Louisiana coastal zone and the lack of publicly

available inland lake and river bathymetric data. In such areas, older, coarser-resolution, topographic data were used from the USGS. When higher-resolution, publicly available data becomes available for these areas, these DEM tiles will be updated with more accurate, detailed elevation and depth information.

## References

C.J. Amante (2018) NOAA National Centers for Environmental Information Topo-Bathymetric Digital Elevation Models: East Florida, NOAA, pp. 6.

[https://www.ngdc.noaa.gov/mgg/dat/dems/tiled\\_tr/east\\_florida\\_tiled\\_navd88\\_2018.pdf](https://www.ngdc.noaa.gov/mgg/dat/dems/tiled_tr/east_florida_tiled_navd88_2018.pdf)